
400 CASE SUMMARIES

Pollution Prevention Primer

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The following case summaries demonstrate the benefits of air pollution prevention for mobile and stationary sources. The case summaries are classified as:

- product reformulation
- product substitution or process change
- equipment maintenance
- VOC reduction in commercial operations, and
- VOC reduction in consumer products.

401 PRODUCT REFORMULATION

401.1 MOBILE SOURCES (GASOLINE)

One way to prevent the emission of air pollutants from mobile sources is to change the fuel. An historic example of pollution prevention through product reformulation is the reduction in lead emissions when leaded gasoline was replaced. In November 1970, California adopted an ambient air quality standard for lead based on a 30-day running average of 1.5 micrograms per cubic meter. In the early 1970's, this standard was exceeded in many areas of the state. However, emissions of lead into ambient air from mobile sources have decreased significantly since 1975 because of regulations phasing out the use of lead in automotive fuel. Between 1978 and 1987, the consumption of leaded-gas decreased by 90 percent and total lead emissions were reduced by 94 percent. California is now in attainment of the state and federal ambient lead standards at all ARB ambient monitoring locations. In January 1992, lead additives used in fuels were banned for use in on-road vehicles in California. Nationally, the Federal Clean Air Act prohibited the use of leaded fuel in on-road vehicles after December 31, 1995.¹

401.2 STATIONARY SOURCES (DIESEL FUEL)

Changing the chemical composition of the fuel is also one way to reduce the air emissions from stationary sources. For example, reducing sulfur in diesel fuel

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can decrease emissions of sulfur dioxide (SO₂), particulate matter (PM), as well as acid rain precursors from stationary engines and well pumps. Higher quality fuel may be voluntarily selected by the source or required by an air pollution control district. For example, the South Coast Air Quality Management District, by District Rule 431.2, limits the sulfur content of diesel fuel to 0.05 percent by weight (i.e. 500 parts per million). In addition, fuel quality may be specified in equipment operating permits.

402 PRODUCT SUBSTITUTION OR PROCESS CHANGE

402.1 MOBILE SOURCES (ALTERNATIVE FUEL)

While diesel fueled vehicles are only 4% of California's 24 million registered vehicles, they emit 60 percent of the soot from on-road mobile sources and 40 percent of the total inventory of oxides of nitrogen (NOX). Alternatives to diesel in heavy duty vehicles significantly reduce emissions of both of these pollutants. For example, NOX reductions of 40 - 60 % have been obtained. The primary alternative fuel for trucks and buses is natural gas. Although the engines are the same, the natural gas can be stored on the vehicle either as liquid (LNG) or as compressed gas (CNG). Typically, school and transit buses use CNG, while heavy duty trucks tend toward LNG.

In Sacramento, Raley's Grocery Company bought 10 new LNG trucks to replace a fleet of aging diesel vehicles. This purchase represents 20 percent of the company's fleet, and was the first time that a company in California bought commercially available LNG fueled trucks. Raley's plans on purchasing another 10 LNG trucks in 1999.

Raley's has built a LNG fueling station which is accessible to the public. This LNG station helps anchor the Interstate Clean Transportation Corridor (ICTC) which is working to create a seamless web of LNG refueling along a 2,000 mile corridor through California, Nevada and Utah. The ICTC project has obtained funding for nine fueling stations and 119 LNG trucks which will reduce NOX emissions along the corridor by 56 tons per year. The ICTC project hopes to encourage more trucking firms to switch to LNG, which would significantly lower truck emissions in this three state region and benefit air quality in five major non-attainment areas, including Sacramento, San Joaquin Valley, Salt

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Lake City, Las Vegas and Los Angeles.

One of the ICTC's local projects is with the San Joaquin Valley Clean Air Transportation Coalition. Three of the ICTC stations, which have been funded, will be located in the San Joaquin Valley - in Tulare, Fresno and Coalinga. Not only will these stations promote fuel substitution in trucks, but they will also be able to dispense CNG, which will encourage more widespread use of natural gas in buses and light duty vehicles.²

402.2 STATIONARY SOURCES (PLASTIC MANUFACTURING)

The benefits of pollution prevention, using process changes, are described in a case study of a Poly Vinyl Chloride (PVC) plant in Pasadena, Texas. In 1987, Occidental Chemical created "OxyMin" a program to systematically reduce hazardous waste, toxic air emissions and water pollution at each of its manufacturing facilities. This facility produces in excess of one billion pounds of PVC resin per year. In 1987, 1.5 million pounds of hazardous waste were generated and then incinerated. Removing toluene from the manufacturing process eliminated generation of 1.5 million pounds of hazardous waste saving the plant over \$500,000 in disposal costs and the toluene substitute cost less. In addition, the process change caused a reduction of 40% in VOC emissions.³

403 EQUIPMENT MAINTENANCE

403.1 MOBILE SOURCES (ENGINE TUNE/SMOG CHECK)

An automobile which is properly maintained is more fuel efficient and produces less air pollution. The California Department of Consumer Affairs, Bureau of Automotive Repair, recommends that an auto owner study the auto manual and use these 10 tips for car care:

- Check your tire pressure and alignment,
- Change your oil and filter,
- Keep it tuned up,
- Check your emission control devices,
- Service your engine properly when warning lights appear,
- Use the oil and fuel recommended by the manufacturer,

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- Change your fuel filter,
- Change your air filter,
- Inspect hoses, wiring and belts, and
- Check crankcase breather elements.

California's 24 million motor vehicles account for about 50 percent of ozone-forming emissions in the state. Emission control devices and the use of reformulated gasoline have substantially reduced motor vehicle emissions. By boosting efforts to detect and repair excessively polluting motor vehicles, California's Smog Check II program is expected to reduce the total volume of smog-forming emissions from California's motor vehicles by approximately 100 tons per day. This is an amount comparable to the ozone-forming emissions produced by all of California's electrical power plants.⁴

403.2 STATIONARY SOURCES (FUGITIVE EMISSIONS)

An Amoco/EPA joint study estimated that VOC losses from storage tanks could be reduced 75 to 93 percent by placing secondary seals on storage tanks and documented the efficacy of a leak detection and repair (LDAR) program.

A LDAR program uses portable VOC detecting instrument to detect leaks during regularly scheduled inspections of valves, flanges, and pump seals. A LDAR program could reduced fugitive emissions 40 to 64 percent, depending on the frequency of inspections.

Install vapor recovery for barge loading is another option to reduce air emissions. One of the largest sources of VOC emissions identified during the Amoco/EPA study was fugitive emissions from loading of tanker barges. It was estimated that theses emissions could be reduced 98 percent by installing a marine vapor loss control system.⁵

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404 VOC REDUCTION IN COMMERCIAL OPERATIONS

404.1 STATIONARY SOURCES

404.1.1 UV Coatings

Coor Brewing Company developed a process for decorating the 100 billion aluminum cans produced annually, which eliminates VOC emissions. The process uses Ultraviolet (UV) light to cure the new coating material rather than gas fired ovens to dry VOC coatings.⁶

404.1.2 Urethane Paint

At the Wirtz Dam, operated by the Lower Colorado River Authority, field encapsulation of lead based paint saved more than \$250,000 in materials, labor and waste disposal costs while reducing VOC emissions. The project was the repainting of about 55,000 square feet of the steel superstructure above the floodgates. The existing coating had high levels of lead and chrome. Conventional abrasive blasting and surface coating had the potential to produce 82 tons of hazardous waste and cost more than \$750,000 to complete. Seeking innovative solutions, the project went out to bid with a specification that lowest cost bid be based upon both waste management and disposal costs. The selected bid used hydroblasting followed by field encapsulation with a low VOC, moisture cured urethane paint. The selected paint had 2.8 pound of VOCs per gallon compared with 7.5 pounds of VOCs per gallon for the conventional coating. This material substitution reduced VOC emissions by 87 percent. The blast water was recycled on site through a closed loop system. The project generated 7,500 gallons of nonhazardous waste water (total lead below 0.306 mg/l) which was sent to a publicly owned treatment works (POTW) at no additional cost. The only hazardous waste generated from the process was 5 tons of spent cross-flow filters and settling tank sludge which were disposed at a cost of \$9,960.⁷

404.1.3 Water Based Paint for Roads

The white and yellow paint used to strip streets, highways and parking lots has been a source of VOC and heavy metals. The conversion to a lead-free, water

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based formula can reduce emissions of VOC and lead as well as reduce employee exposure. In Cincinnati, Ohio, the new formulation eliminated approximately 33,000 pounds of lead and 36,000 pounds of VOCs each year.⁸

404.1.4 Centrifugal Force as a Non-Chemical Cleaner

In Indiana, Nachi Technology, Inc. eliminated the use of a solvent (1,1,1-trichloroethane) cleaning process by developing a centrifugal force process to clean the precision ball bearings which it makes for the automotive industry.⁹

404.1.5 Solvent Substitution

In Colorado, Martin Marietta's Astronautic Group, Daraclean 282 was used for degreasing rocket components as a substitute for 1,1,1-trichloroethane. The company saved \$600,000 annually after initial up front costs of \$270,000.¹⁰

405 VOC REDUCTION IN CONSUMER PRODUCTS

VOCs react with oxides of Nitrogen and sunlight and form ground level ozone (O₃) which can cause adverse human health effect. Most Californians live in areas where photochemical smog (i.e. ozone) reaches unhealthful levels. Due to the state's population, it has been estimated that 75% of the nation's human ozone exposure is in California.

Deodorants, hair spray, cleaning products, and insecticides are examples of common consumer products which in 1990 emitted 265 tons of smog-forming pollution into California's air every day - more than all the refineries and gas stations in the state.

California's clean air plan, the State Implementation Plan (SIP) commits to an 85% reduction in ozone-forming pollution from consumer products. To achieve this target, ARB is working with industry to make sure that consumer product regulations are technologically and commercially feasible. The ARB is phasing in near, mid, and long-term pollution prevention measures with target dates of 2000, 2005, and 2010, respectively. Near term measures for 28 product categories are in place and mid-term measures were recently adopted for 18 additional categories.¹¹

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406 REFERENCES

1. Proposed Identification of Inorganic Lead as a Toxic Air Contaminant: Executive Summary, Air Resources Board and Office of Environmental Health Hazard Assessment, October 31, 1996, Sacramento, CA
2. Personal Communication, Cliff Gladstein, Gladstein and Associates, Santa Monica, CA. November 5, 1998
3. The National Pollution Prevention Roundtable Fall Conference Proceedings, Washington, D. C. , December 1995.
4. Car Care Tips, California Department of Consumer Affairs, Bureau of Automotive Repair, March 1996. Also, see <http://www.smogcheck.ca.gov>.
5. US EPA, Profile of the Petroleum Refining Industry, EPA/310-R-95-013, Washington, D.C., 1995.
6. US EPA, Pollution Prevention 1997: A Nation Progress Report, Washington, D.C., 1997.
7. The National Pollution Prevention Roundtable Fall Conference Proceedings, Washington, D.C., 1995
8. US EPA, Pollution Prevention 1997: A Nation Progress Report, Washington, D.C., 1997.
9. US EPA, Pollution Prevention 1997: A Nation Progress Report, Washington, D.C., 1997
10. US EPA, Pollution Prevention 1997: A Nation Progress Report, Washington, D.C., 1997.
11. ARB Consumer Products information is available on the Internet at: <http://www.arb.ca.gov/html/brochure/consprod.htm>